DOCUMENT RESUME

ED 206 762 UD 021 604

AUTHOR Roseman, Curtis C.; McHugh, Kevin E.
TITLE Metropolitan Areas as Redistributors of Population.
PUB DATE Apr 81
NOTE 44p.: Paper presented at the Annual Meetings of the Association of American Geographers (Los Angeles, CA, April, 1981). For a related document, see ED 168 770.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Demography; *Metropolitan Areas; *Migration Patterns; *Population Distribution; Population Trends; *Relocation; *Urban to Rural Migration; *Urban to Suburban Migration

ABSTRACT

This paper reports on a demographic study that focuses on the patterns of migration to and from specific metropolitan areas which contribute to nonmetropolitan growth and decline. For background, the paper examines some general properties of the United States migration system. Then the concept of metropolitan areas as redistributors of population is developed. A distinction is made between inmigration and outmigration from within a specified field, or population area. It is shown that the very largest metropolitan areas contributed to nonmetropolitan population turnaround in the 1960s because of their early arrival at a net outmigration state, although smaller metropolitan areas also played a role in outward redistribution of population. (Author/APM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED206762

METROPOLITAN AREAS AS REDISTRIBUTORS OF POPULATION

Curtis C. Roseman
UNIVERSITY OF ILLINOIS

and

Kevin E. McHugh
UNIVERSITY OF ILLINOIS

Paper Presented at the Annual Meetings of the Association of American Geographers, Los Angeles, April 1981

US021604

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Curtis C. Roseman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

METROPOLITAN AREAS AS REDISTRIBUTORS OF POPULATION

The significant patterns of population redistribution within the United States over the last twenty years have been largely the product of migration rather than differential natural change. Perhaps the most visible outcomes of changing migration patterns have been the decrease in rates of metropolitan population growth, the associated onset of decline for many metropolitan areas, and rapid increases in rates of growth in a large number of nonmetropolitan areas which had previously been experiencing steady population losses.

Most investigations of the recent population "turnaround" have focused on the post-1970 period when the trend became clearly evident in published data on net migration and population change. Yet, there is evidence that the turnaround was under way in the 1960s, especially in terms of the important migration component. Alonso (1971), for instance, shows that 45 percent of all SMSAs (and nine of the twenty largest) lost population through migration in the 1960-65 period. Similarly, Morrison and Wheeler (1976) show that many SMSAs had near-zero or negative net migration between 1960 and 1970 but were still growing due to a greater natural increase. The "hidden" turnaround had to await the lowering of birth rates before it became widely evident. In nonmetropolitan areas, the turnaround was not as pervasive before 1970. Nonetheless, in the 1960s important changes in settlement structure appeared (Fuguitt and Beale, 1978; Morrill, 1980), and large numbers of nonmetropolitan

counties began experiencing net inmigration for the first time in many decades, especially those which were adjacent to SMSAs, those with a recreation/amenity base, and those with major universities (McCarthy and Morrison, 1978; Beale, 1975; Beale, 1977). Continued overall population decline in nonmetropolitan America as a whole during the 1950s and through the 1960s, however, tended to overshadow the emergence of growth through migration in specific nonmetropolitan places during the 1960s. By the mid-1970s widespread nonmetropolitan population growth was clearly evident.

The spatial patterns of both declining metropolitan areas and growing nonmetropolitan places are fairly well known (Morrison and Wheeler, 1976; Roseman, 1977; Morrill, 1978), but little is known about the spatial linkages between them. The purpose of this paper is to examine these linkages by analyzing the spatial patterns of migration flows between metropolitan and nonmetropolitan places for the 1965-70 period.

This study focuses on migration fields of metropolitan areas--the pattern of migration flows to and from specific metropolitan areas which contribute to nonmetropolitan growth and decline. This research furthers our understanding of the recent population "turnaround" by isolating pre-1970 metropolitan-nonmetropolitan migration linkages which influenced the spatial pattern of population change in nonmetropolitan places.

Previous studies (Wolpert, 1967; MacKinnon and Skarke, 1977; Slater, 1981) suggest that migration fields of metropolitan areas

vary in spatial coverage; some fields are quite extensive ("cosmopolitan") while others are more spatially restricted ("provincial"). Large metropolitan areas are expected to have more cosmopolitan fields than smaller urban places because of their central position in transportation and communication networks which influence spatial patterns of migration.

In this paper, we first examine some general properties of the U.S. migration system as background for the more specific analyses which follow. Second, the concept of metropolitan areas as redistributors of population is developed--the idea that inmigration and outmigration fields for particular metropolitan areas are asymmetric because of differing bases for destination selection among individual migrant decision makers. Third, the spatial extent of migration fields, the asymmetries between in- and outmigration fields, and the specific place-to-place flows which are key contributors to that asymmetry are examined utilizing transaction flow analysis.

THE CONTEXT

Our data come from the matrix of migration flows among 510 State Economic Areas (SEAs) for the period 1965-70. The data are derived from a 15 percent sample and estimate the total number of migrants five years of age and older among all SEAs. For purposes of our analyses several of the 205 metropolitan SEAs are combined and some nonmetropolitan SEAs are attached to metropolitan SEAS, in order

that our metropolitan SEAs would match as closely as possible the 1970 configuration of SMSAs. Included in the combinations are several adjacent SEAs which straddle state boundaries, such as Kansas City, Missouri, and Kansas City, Kansas. The result is a new matrix of flows among 467 SEAs, 167 of which are designated as metropolitan, and 300 of which are nonmetropolitan.

For the background analyses, the SEAs are grouped into six size categories, two nonmetropolitan and four metropolitan. Net migration among these categories clearly indicates the overall tendency for movement toward metropolitan areas and up the urban hierarchy (Table 1). However, there are two exceptions to these trends: (1) the largest metropolitan category (containing SEAs with more than one million population) lost migrants to the next smaller metropolitan category, an indication of net movement down the urban hierarchy at the highest levels of that hierarchy; and (2) the largest metropolitan category also experienced a net loss to the largest nonmetropolitan category, an indication of the key role played by at least some of the largest metropolitan areas in contributing to nonmetropolitan growth in the pre-1970 period.

Next, the efficiency, Eij, of the system is examined (Table 2).

$$Eij = Nij/(Mij + Mji) \times 100$$

where: Mij = gross migration, place i to place j

Mji = gross migration, place j to place i

Nij = Mij - Mji

None of the efficiency values exceed |13|, an indication that the system is rather inefficient, having large gross flows relative to the net exchange of migrants. The efficiency values, in fact, are considerably lower than comparable values we calculated for 1955-60. In the earlier period, nonmetropolitan to metropolitan net migration flows were larger and more efficient. In the 1965-70 period, then, the migration system was fragile, being in a transition from a clear metropolitan-directed movement of the previous decades, to the 1970s' situation in which movement in the opposite direction was the rule.

Especially important in this system are a few of the largest metropolitan areas. New York City, Chicago, and Los Angeles accounted for about one-third of the 752,000 gross migration from the largest metropolitan category to the two nonmetropolitan categories. These three urban areas had net losses of 28,000, 29,000, and 7,000, respectively, to nonmetropolitan areas.

Because large metropolitan areas usually have spatially extensive, or "cosmopolitan" migration fields compared to smaller ones, the impact of net outmigration from these large places can be widespread. This is illustrated in the maps of nonmetropolitan SEAs which were experiencing overall net outmigration yet were gaining from New York City, Chicago, or Los Angeles (Figures 1, 2, and 3). The spatial extent of this "leading edge" of nonmetropolitan growth from the largest cities is considerable. Thus, the "cosmopolitanness" of their migration fields results in a spatially extensive impact upon the growth and decline of nonmetropolitan areas during the study period.

TABLE 1

NET MIGRATION AMONG SIX SIZE CATEGORIES OF SEAs, 1965-70 (THOUSANDS)

	NONMETROPOLITAN SIZE CATEGORIES (THOUSANDS)		METROPOLITAN SIZE CATEGORIES (THOUSANDS)			
	<200	≥200	<250	250-500	500-1,000	>1,000
	1	2	3	4	5	6
1		101	43	56	58	37
2			9	84	45	-413
3				33	37	60
4					32	25
5						-117

POSITIVE NUMBERS INDICATE NET MIGRATION TOWARD THE LARGER POPULATION CATEGORY.

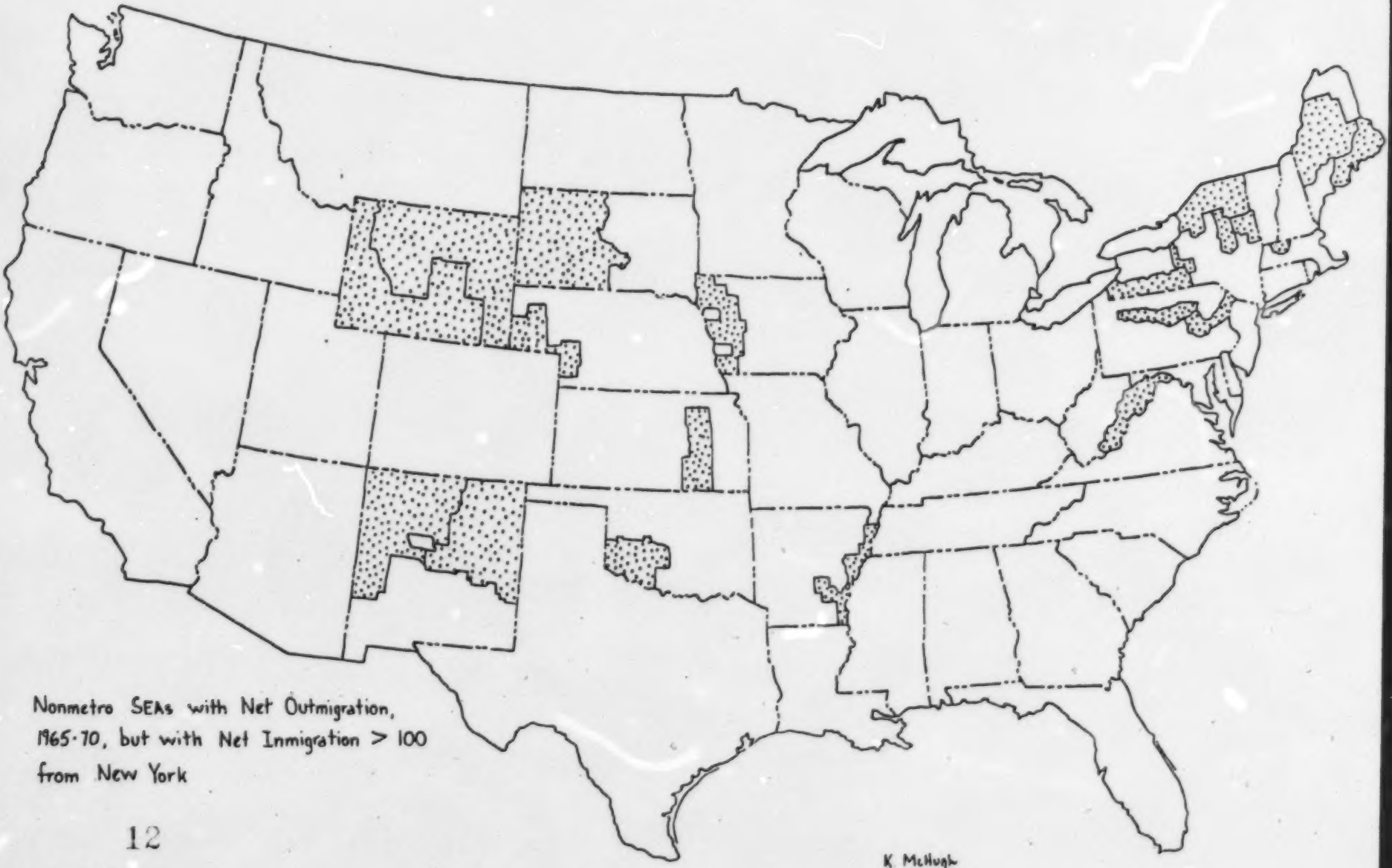
TABLE 2

MIGRATION EFFICIENCIES AMONG SIX SIZE CATEGORIES OF SEAs, 1965-70

	NONMETROPOLITAN SIZE CATEGORIES (THOUSANDS)		METROPOLITAN SIZE CATEGORIES (THOUSANDS)			
	< 200	⩾ 200	<250	250-500	500-1,000	⩾ 1,000
	1	2	3	4	5	6
1		5.3	7.5	7.3	9.7	2.4
2			.7	4.7	3.5	-10.1
3				6.8	12.0	5.2
4					6.6	1.5
5						-7.2

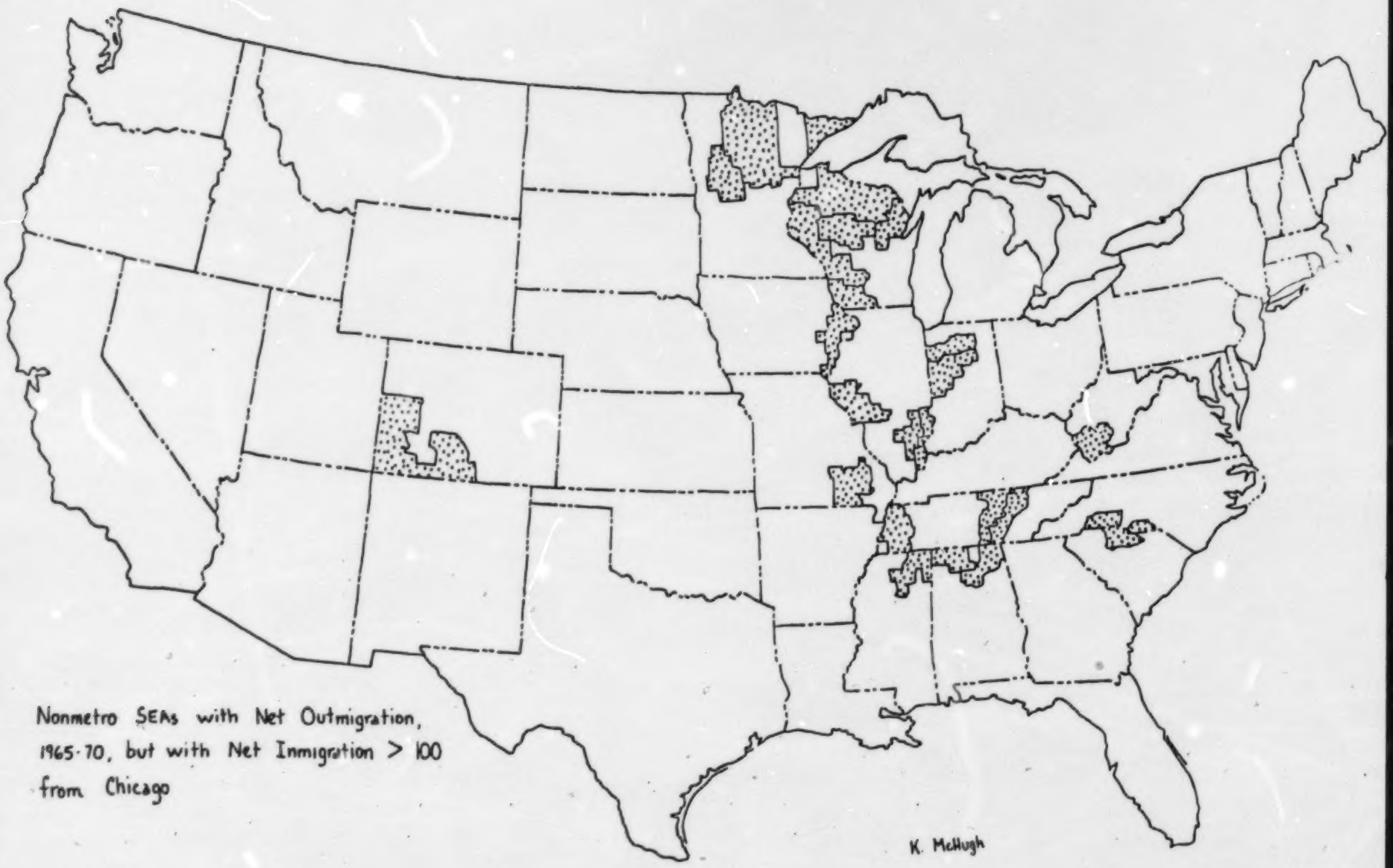
POSITIVE NUMBERS INDICATE NET MIGRATION TOWARD THE LARGER POPULATION CATEGORY.

FIGURE 1



Nonmetro SEAs with Net Outmigration, 1965-70, but with Net Inmigration > 100 from New York

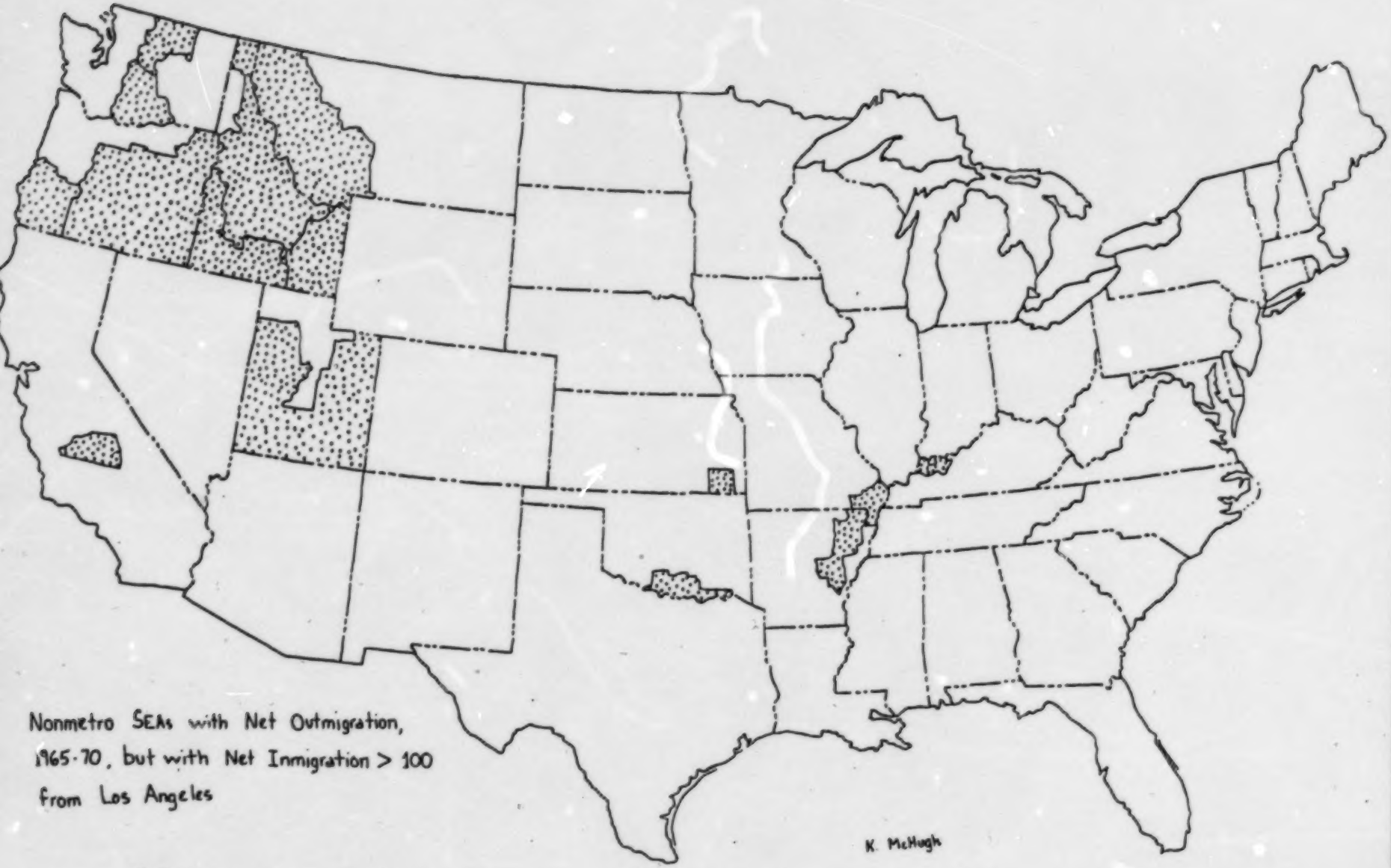
FIGURE 2



Nonmetro SEAs with Net Outmigration, 1965-70, but with Net Inmigration > 100 from Chicago

K. McHugh

FIGURE 3



Nonmetro SEAs with Net Outmigration, 1965-70, but with Net Inmigration > 100 from Los Angeles

K. McHugh

PLACE-SPECIFIC TIES AND MIGRATION FIELDS

It is generally agreed that place-specific kinship ties have been important to individual and household destination selection over the long history of nonmetropolitan to metropolitan migration in the United States and other countries (Price and Sikes, 1976). Potential urban-bound migrants were (and are) "channelized" to particular destinations through information gained from previous migrants (Roseman, 1971; Tilly and Brown, 1968). In addition, previous migrants from the same nonmetropolitan origin area offer assistance to the newcomers at the urban destination. As a result of this process, rural inmigration fields of metropolitan areas are likely to be somewhat provincial, or spatially restricted--often limited largely to the regional hinterland plus one or two more distant channelized source areas.

Today, when migration in the opposite direction is more important numerically in the United States and other countries, destination selection is likewise somewhat dependent upon place-specific ties for migrants to nonmetropolitan areas. However, we suggest that the basis for such ties is considerably broader in the case of metropolitan to nonmetropolitan migration (Roseman and Williams, 1980). Some metropolitan residents have ties to nonmetropolitan areas through previous residence and, thus, are potential return migrants. Others have parental roots in a nonmetropolitan place, while still others have friends or relatives whom they might follow. The influence

of friends and relatives could be particularly important to the elderly in the choice of a retirement location. In addition, much of our metropolitan population has vacation experience in nonmetropolitan places, often in the form of a two-week vacation repeated year after year upon which social, psychological, and/or investment ties to specific places are established. Finally, an important portion of our metropolitan population has nonmetropolitan ties as the result of college or military experiences.

If, in fact, the breadth of ties collectively existing among potential outmigrants from metropolitan areas manifests itself in aggregate migration flows, we would expect metropolitan outmigration fields to be more cosmopolitan than metropolitan inmigration fields. This might be especially true during, or just prior to, the non-metropolitan turnaround. Specific flows should be directed to a wider variety of nonmetropolitan places, including hinterlands, channelized source areas, and recreation/amenity areas of national and/or regional importance. In this sense, metropolitan areas should be spatial "redistributors" of population.

Metropolitan redistributors have been identified in previous research, but only in a fragmentary way and not with specific reference to nonmetropolitan areas. Morrison (1977), for example, noted that during the 1965-70 period, Los Angeles, San Francisco, and San Diego tended to draw migrants from outside of California but send them in large numbers to elsewhere within the state. In contrast to these

three "national magnets," the other metropolitan areas in California drew migrants primarily from elsewhere in California. Another type of redistributor was identified by Roseman (1977). Some metropolitan areas which are seats of major universities were "outward" redistributors. For example, the Tuscaloosa, Alabama, metropolitan area dominantly drew migrants (including many students) from Alabama but sent many more to all parts of the country.

MIGRATION FIELD AND FLOW ANALYSES

In order to examine the spatial extent of migration fields, the asymmetries between in- and outmigration fields, and the specific place-to-place flows which contribute to asymmetry, transaction flow analysis is employed. This technique has been used to identify channelized nonmetropolitan to metropolitan migration (Roseman, 1971) and to examine overall structure of migration systems (Flowerdew and Salt, 1979), but it has not been used to examine metropolitan to nonmetropolitan flows.

The basis for transaction flow analysis is an indifference model which assumes (in the outmigration case) that each metropolitan SEA will distribute its migrants in proportion to the total number of migrants received in each nonmetropolitan place from all metropolitan SEAs. Thus, the indifference model is simply a measure of overall attraction as measured by total inmigration at each destination. For migration toward metropolitan areas, the

indifference model is based on the total outmigration from each nonmetropolitan SEA to all metropolitan SEAs.

First, to measure the spatial extensiveness of the metropolitan migration fields, the P statistic is derived.

For outmigration fields:

$$P = \sum_{J=1}^{300} \frac{50|Aij - Eij|}{\sum_{J=1}^{300} Aij} \; ; \; 0 \leq P \leq 100$$

where: Aij = Actual flow from metro place i to nonmetro place j

Eij = Flow from i to j expected by the indifference model

The P statistic is essentially the same as the index of dissimilarity used by sociologists, geographers, and others, and can be described as the percentage of migrants who would have to have chosen a different destination (origin) in order that the flows from (to) a particular metropolitan SEA would fit the indifference model perfectly. The lower the value of the P statistic, the closer the fit with the total pattern of migration to nonmetropolitan areas; hence, the lower the P value, the more cosmopolitan the migration field.

For metropolitan inmigration fields (migration from all nonmetropolitan SEAs to each individual metropolitan SEA), the P ranges

from 40.1 to 78.7. Metropolitan SEAs with low values include Chicago, Philadelphia, and Washington, plus several southwestern cities (Figure 4), places which tend to draw relatively evenly from nonmetropolitan areas around the country. Metropolitan areas with high P values, and hence with more provincial inmigration fields, are typically smaller and scattered throughout the eastern half of the country. The simple correlation between P and the gross inmigration of each metropolitan SEA (utilized as a measure of size or attractiveness) is -.47, confirming the tendency for large metropolitan places to have more cosmopolitan inmigration fields.

For outmigration fields, P ranges from 30.1 to 82.4, a range greater than that for inmigration fields. Low values, and cosmopolitan outmigration fields, exist for Chicago and Washington, plus southwestern and Florida metropolitan areas (Figure 5), a pattern similar to that for inmigration fields. The simple correlation between P and gross outmigration (a surrogate for size) is -.48, confirming that outmigration fields of large metropolitan areas, like their inmigration fields, tend to be more cosmopolitan than those of smaller metropolitan areas.

There are important differences between the spatial patterns of in- and outmigration fields as hypothesized earlier. The majority of metropolitan SEAs, 105 of the 167, have outmigration P values smaller than their inmigration P values, indicating that they are "outward redistributors"; that is, their outmigration fields

FIGURE 4

P Statistic for Metro SEAs Based Upon Immigration from Nonmetro SEAs

- ● P_i Statistic $\geq$ 75.0
- ▲ P_i Statistic $<$ 50.0

K. McHugh

FIGURE 5

Portland
Bay City
Sioux City
Waterloo
Ogden
Chicago
Hamilton
Altoona
Lincoln
Muncie
Washington
San Francisco
Decatur
Terre Haute
Richmond
Newport News
Norfolk
Colorado Springs
Roanoke
Evansville
Los Angeles
San Diego
Phoenix
Tucson
Columbus
Monroe
Jackson
El Paso
San Antonio
Orlando
Tampa
Ft. Lauderdale - Miami
P Statistic for Metro SEAs Based Upon Outmigration to Nonmetro SEAs
● P_j Statistic ≥ 75.0
▲ P_j Statistic < 45.0
K. McHugh

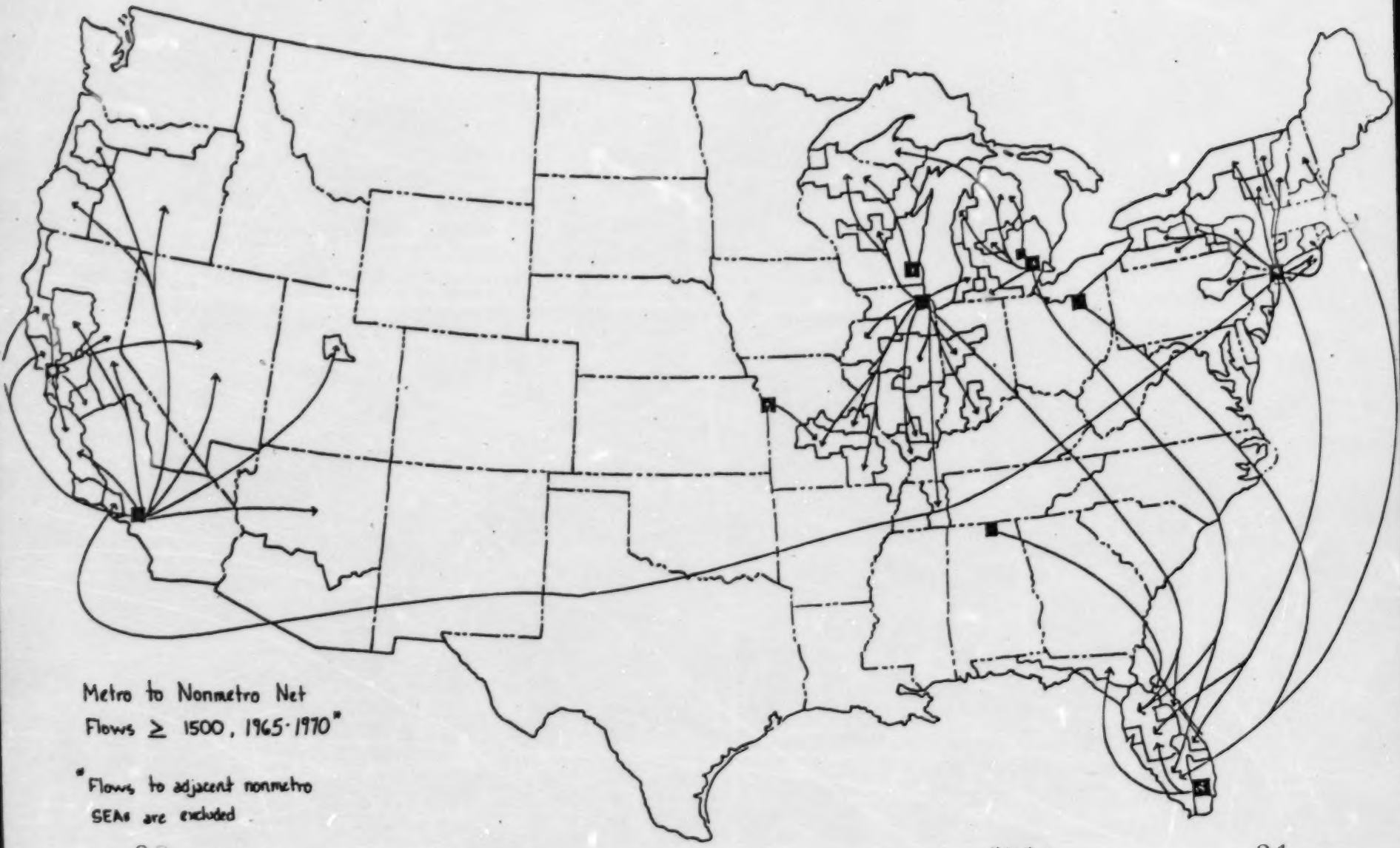
are spatially more extensive than their inmigration fields as expected. This is particularly true for the large metropolitan areas, since 36 of the 47 metropolitan SEAs with populations greater than 500,000 are outward redistributors. The correlation between gross inmigration (a measure of size) and the difference between the P values is .45, an indication of the greater tendency for large metropolitan places to be outward redistributors. The spatial pattern of these large outward redistributors is widespread (Figure 6), illustrating that metropolitan areas in all parts of the country are each contributing to nonmetropolitan growth in a relatively broad area. In contrast, the few inward redistributors in this size category are clustered in the Northeast and upper Midwest.

In the first analysis of individual place-to-place flows, the largest net flows (>1500) from metropolitan to nonmetropolitan areas are mapped (Figure 7) (excluding, for clarity, flows to adjacent nonmetropolitan areas). Because of the absolute size criterion for mapping, origins are limited, for the most part, to the largest metropolitan areas. This is justified, however, since these are the very net flows most affecting the emergence of the nonmetropolitan population turnaround. The importance of recreation/amenity areas is clear: Florida, with a national attraction, receives numerous large net flows from eastern metropolitan areas. More regionally-based amenity/recreation areas receive large net flows from nearby

FIGURE 6

K McHugh

FIGURE 7



Metro to Nonmetro Net
Flows ≥ 1500, 1965-1970*

*Flows to adjacent nonmetro SEAs are excluded

K. McHugh

large metropolitan places: northern Michigan from Detroit, northern Wisconsin and the Missouri Ozarks from Chicago, northern New York and New England from New York City and Boston, and Oregon from Los Angeles. A few additional net flows are found to extend to traditional migrant source areas (e.g., Chicago to Southern Illinois and Tennessee), to exurban areas near other large cities, and to locations of major universities. Overall, the major leading edge of the turnaround appears to be flows from large metropolitan areas to amenity/recreation areas.

As a second analysis of individual migration flows, spatial aspects of the asymmetry of in- and outmigration fields are examined. For this analysis "salient" flows are defined as those exceeding, by stated minima, the amount of flow expected by the indifference model. Here, two statistics are used, an absolute difference, Dij, and a relative difference, RAij:

$$Dij = Aij - Eij$$

$$RAij = Dij/Eij$$

where: Aij = the actual flow from place i to place j

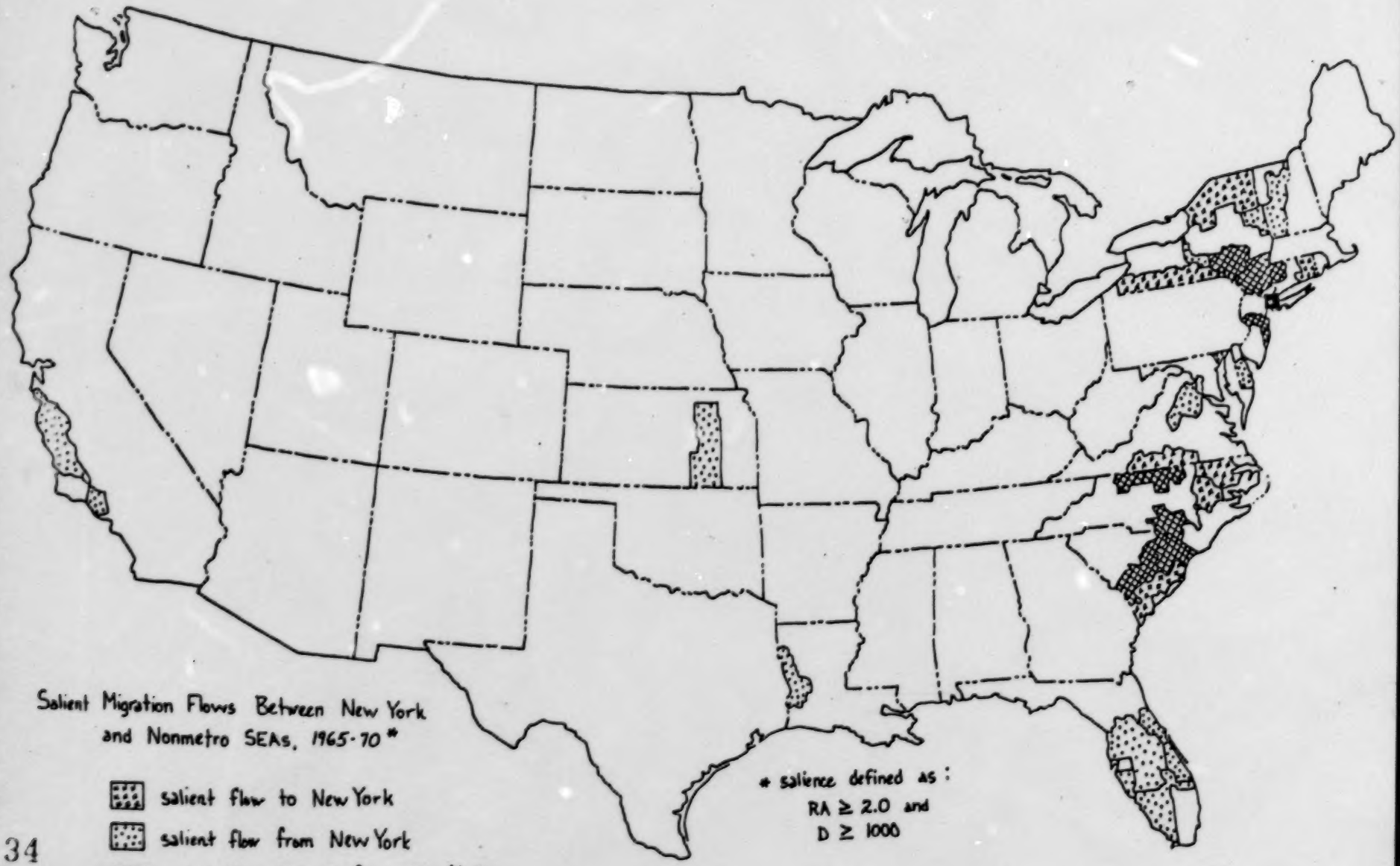
Eij = the amount of flow expected by the indifference model

Salient flows are specifically defined here as those with a D value greater than 1000 (a gross flow greater than expected by 1000 migrants) and an RA value greater than 2.0 (a flow 200 percent greater than expected). Since the largest cities tend to have the most impact

on population change in nonmetropolitan areas during the period, and since the largest also tend to have the most cosmopolitan migration fields, this analysis limits consideration to New York City, Chicago, and Los Angeles.

Maps comparing salient migration flows toward and away from these three metropolitan areas (Figures 8, 9, and 10) tend to confirm our expectations that place specific flows outward from metropolitan areas touch a greater variety of nonmetropolitan places than do flows toward metropolitan areas. In the case of New York (Figure 8), inmigration salient flows are limited to hinterland areas, especially in New York State, plus the traditional source of channelized flows in the Carolinas. Outmigration salient flows return migrants to some of these areas, but also extend to Florida, Vermont, some exurban areas adjacent to other cities, and a few additional scattered locations (including SEAs in Louisiana and Kansas containing large military installations). Chicago (Figure 9) has a very clear asymmetry as an outward redistributor: its inmigration is from the hinterland plus selected areas in the South, whereas its outmigration is back to the hinterland, parts of the South, and uniquely directed to the amenity areas of Florida, the Ozards, and Wisconsin. The few inmigration salient flows to Los Angeles (Figure 10), from large SEAs in Wyoming and southern New Mexico for example, are greatly outnumbered by salient flows from that metropolitan area. Outmigration salient flows from

FIGURE 8



Salient Migration Flows Between New York and Nonmetro SEAs, 1965-70 *

- salient flow to New York
- salient flow from New York
- salient flow to and from New York

* salience defined as:
RA ≥ 2.0 and
D ≥ 1000

K. McHugh

FIGURE 9

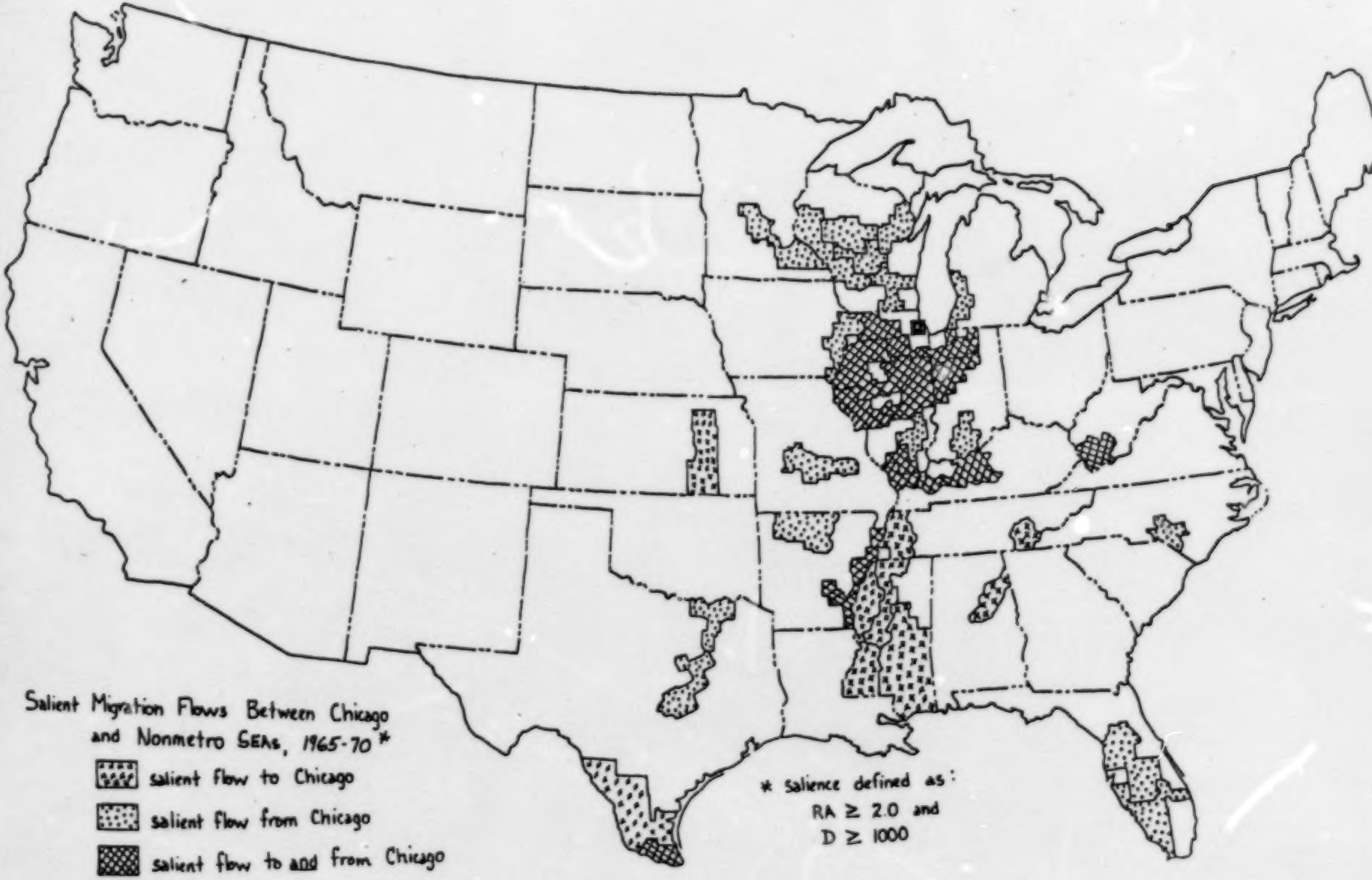

Salient Migration Flows Between Chicago and Nonmetro SEAs, 1965-70*
salient flow to Chicago
salient flow from Chicago
salient flow to and from Chicago
* Salience defined as:
RA ≥ 2.0 and
D ≥ 1000
K McHugh

FIGURE 10

Salient Migration Flows Between Los Angeles and Nonmetro SEAs, 1965-70*

- salient flow to Los Angeles
- salient flow from Los Angeles
- salient flow to and from Los Angeles

* salience defined as:
RA ≥ 2.0
D ≥ 1000

K. McHugh

Los Angeles extend from Washington to the South and include flows, perhaps composed largely of return migrants, to Arkansas and Oklahoma. These are traditional source areas of channelized migration to Los Angeles which have now dried up.

CONCLUSION

In this relatively inefficient system of migration flows we can see the beginnings of the nonmetropolitan population turnaround. The very largest metropolitan areas contributed to the turnaround in the 1960s because of their early arrival at a net outmigration state. Due to the cosmopolitan nature of their migration fields, the impacts of their net outmigration were spatially widespread among nonmetropolitan places. As hypothesized, the majority of metropolitan areas were outward redistributors of migrants, consistent with the notion that metropolitan residents collectively have a wide variety of ties to nonmetropolitan places. The largest metropolitan areas are also most likely to be outward redistributors, further reinforcing their key role in the population turnaround.

The largest metropolitan areas during this time period, therefore, were on the leading edge of the nonmetropolitan turnaround. It may be that, as the turnaround fully emerged in the 1970s, smaller metropolitan areas began to play a greater role in population redistribution affecting nonmetropolitan areas, by developing more asymmetrical migration fields. It is likely, however, that their

fields would remain relatively provincial and thus their influence more regional than national.

Research under way will compare the results of this research with the state of the U.S. migration system prior to the turnaround, 1955-60, and following the clear emergence of the turnaround, 1975-80. These analyses should reveal important changes in spatial aspects of the migration system and lead to further understanding of the population redistribution process in general.

LITERATURE CITED

Alonso, William, 1971, The System of Intermetropolitan Population Flows. Berkeley, Ca: University of California, Institute of Urban and Regional Development, Working Paper No. 155.

Beale, Calvin L., 1975, The Revival of Population Growth in Nonmetropolitan America. Washington, DC: U.S. Department of Agriculture, Economic Research Service, ERS-605.

_____, 1977, The recent shift of the United States population to nonmetropolitan areas, 1970-75. International Regional Science Review, Vol. 2, 113-122.

Flowerdew, Robin and Salt, John, 1979, Migration between labour market areas in Great Britain, 1970-71. Regional Studies, Vol. 13, 211-231.

Fuguitt, Glenn V. and Beale, Calvin L., 1978, Population trends of nonmetropolitan cities and villages in subregions of the United States. Demography, Vol. 15, 605-620.

MacKinnon, Ross D. and Skarke, Anna Maria, 1977, Exploratory analyses of interregional migration tables: An Austrian example. Regional Studies, Vol. 11, 99-111.

McCarthy, Kevin F. and Morrison, Peter A., 1978, The Changing Demographic and Economic Structure of Nonmetropolitan Areas in the 1970s. Santa Monica, Ca: Rand Paper No. P-6020.

Morrill, Richard L., 1978, Population redistribution, 1965-1975. Growth and Change, Vol. 9, 35-43.

_____, 1980, The spread of change in metropolitan and non-metropolitan growth in the United States, 1940-1976. Urban Geography, Vol. 1, 118-129.

Morrison, Peter A. and Wheeler, Judith P., 1976, Rural renaissance in America? The revival of population growth in remote areas. Population Bulletin, Vol. 31. Washington, DC: Population Reference Bureau.

_____, 1977, Urban growth and decline in the United States: A study of migration's effects in two cities. Chapter 14 in Brown, Alan A. and Neuberger, Egon (eds.), Internal Migration: A Comparative Perspective. New York: Academic Press, 235-254.

Price, Daniel O. and Sikes, Melanie M., 1975, Rural-Urban Migration Research in the United States. Bethesda, Md: National Institute of Child Health and Human Development, Center for Population Research.

Roseman, Curtis C., 1971, Channelization of migration flows from the rural South to the industrial Midwest. Proceedings, Association of American Geographers, Vol. 3, 140-146.

_____, 1977, Changing Migration Patterns within the United States. Washington, DC: Association of American Geographers, Resource Paper No. 77-2.

_____ and Williams, James D., 1980, Metropolitan to nonmetropolitan migration: A decision-making perspective. Urban Geography, Vol. 1, 283-294.

Slater, Paul B., 1981, Combinatorial procedures for structuring internal migration and other transaction flows. Quality and Quantity, Vol. 15, 179-202.

Tilly, Charles and Brown, Claude Harold, 1967, On uprooting, kinship and the auspices of migration. International Journal of Comparative Sociology, Vol. 8, 139-164.

Wolpert, Julian, 1967, Distance and directional bias in inter-urban migratory streams. Annals, Association of American Geographers, Vol. 57, 605-616.